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- You have already driven a car with an automotic transmission, then you know that there are two great differences between an automotive transmission and a manual transmission: no um The clutch pedal in an automotic transmission car. There is no gear change in an automatic car transmission. After you put the transmission to the unit, all the rest is automoty.bot the automatic transmission (plus your torque converter) and a manual transmission (with your clutch) performs exactly the same thing, but they do in totally different ways. It turns out that the way an automatic transmission is absolutely incredible! In this article, we will work on our automatic transmission. Let's start with the key to any system: Planetries gearsets. Then we will see how the transmission is assembled, learn how the controls work and discuss some of the complexes involved in the control of a transmission. Just as well as that of a manual transmission, the automoty main work of the Transmission is to allow the engine to operate in its narrow range of speeds, providing a wide range of Saüda velocities. In a transmission, the cars would be limited to a gear ratio, and this relationship would have to be selected to allow the car to travel on the desired maximum speed. If you wanted a maximum speed of 80 mph, then the gear ratio would be similar to the third march in most manual transmission cars. You probably never tried to drive a manual transmission car using only third march. If you did, you would quickly find that you almost had no acceleration by starting, and at high speeds, the engine would be screaming near the red line. A car like this would wear very quickly and would be almost underrivable. So the transmission uses gears to make more effective use of engine torque and keep engine operating at an appropriate speed. By towing or transporting heavy objects, your vehicle's transmission can get hot enough to burn the transmission fluid. In order to protect the transmission of serious damage, drivers that taper should purchase vehicles equipped with transmission refrigerators. The key difference between a manual and an automotive transmission is that the manual transmission blocks and unlocks different gear sets for the output axis for several gear rates, while in a transmission Automotics, the same set of gears produces all the different gear rates. The planetary gearset is the device that makes it possible in an automatic transmission.let takes a look at how the planetary gearset works. Why you separate and look within an automotic transmission, you find a wide variety of pieces in a fairly small space. Among other things, you see: an ingenious set of planetary planetal bands to block parts of a set of three wet plate clutches to block other parts of the incredibly strange hydro-cell system that controls clutches and the large Band Gear Pump to move the fluid transmission around the center of attention is the planetary gearset. On the size of a cantaloupe, this part creates all the different reasons of gear that the transmission can produce. All the rest in the transmission is there to help the planetary gearset doing its thing. This incredible piece of gear appeared in HowStuffWorks before. You can recognize it in the Electric Screwdriver article. An automotive transmission contains two full planetal networks folded into a component. Here's how gear reasons work for an introduction to planetary gearsets. Any planetary gearset has three main components: the planet gear the planet gears and the planet's conveyor "The Geararch ring of these three components can be the input, the output It can be held stationary. Choosing which piece plays which paper determines the gear ratio for the gear set. Let's take a look at a single planetary gearset. One of the planetal marches of our transmission has a ring gear with 72 teeth and a sun gear with 30 teeth. We can get many many Gear racings outside this greater. Also, blocking any two of three components together blocking the entire device in a gear reduction 1: 1. Note that the first gear rate listed above is a reduction The skirt speed is slower than the input speed. The second is an overdrive - the output speed is more than the input speed. The last one is a reduction again, but the direction direction is reversed. There are several other proportions that can be obtained from this set of planetal gears, but these are the ones that are relevant to our automatic transmission. You can experience them in the animation below: Animation of the different gear rings related to automatic transmissionsClick on the left buttons in the above table. So, this set of gears can produce all these different gear reasons without having to engage or disengage any other gears. With two of these consecutive gears, we can get the four gears forward and a reverse gear our transmission needs. Let's put the two sets of gears together in the next Section. This automatic transmission uses a set of gears, called set of composite planetal gears, which looks like a single planetary gear, but actually behaves like two combined planetary marches. It has a ring gear that is always the output of the transmission, but has two solar gears and two sets of planets.Letre See some of the parts: The figure below shows the planets in the planet's conveyor. Notice how the planet on the right gets smaller than the planet on the left. The planet on the right does not involve the ring gear - involves the other planet. Only the planet on the left involves the ring gear. You can see the interior of the planet conveyor. The shortest gears are engaged only by the smaller solar gear. The longest planets are engaged by the largest solar gear and the smaller planets. The animation below shows how all pieces are linked in a transmission. Move the change lever to see how the energy is transmitted through the transmission. The smaller sun gear is triggered towards the turbine in the torque converter. The conveyor planet tries to turn on the anti-hatching direction, but it is still maintained by the unidirectional clutch (which only allows the rotation in the hourly direction) and the ring gear transforms the skirt. The small gear has 30 teeth and the ring gear is 72, so the rate of gears is: ratio = - R / s = - 72/30 = -2.4: 1Side rotation is Negative 2.4: 1, which means that the direction of the Saüda is in front of the input direction. But the direction of the Saüda is really the same as the input direction - is that the trick with the two sets of planets enter. The first set of planets involves the second set and the second set rotates the ring gear; This combination reverses the direction. You can see that this would also cause the greater sun gear; But because this clutch is released, the larger sun gear is free to rotate in the opposite direction to the turbine (counterclockwise) .Move the change lever to see how the energy is Transmitted through transmission. This transmission does something actually tidy to get the required proportion for the second equipment. It acts as two planetal marches connected with each other with a common planet carrier. The first stage of the conveyor planet actually uses the larger sun gear as the ring gear. Thus, the first stage consists of the sun (the smaller sun gear), the planet carrier, and the ring (the larger sun gear). The entrance is the small solar gear. The ring gear (large solar gear) is maintained stationary by the band, and the exit is the planet's carrier. For this With the sun as an input, conveyor planet as exit, and the fixed ring gear, the fansula is: 1 + r / s = 1 + 36/30 = 2.2: 1 The planet carrier turns 2.2 times for each rotot The small sun gear. In the second stage, the planet holder acts as the entrance to the second set of planetary gears, the larger solar gear (which is stationary) acts as the sun, and the ring gear acts as the outlet, then The gear ratio is: 1 / (1 + S / R) = 1 / (1 (1 36/72) = 0.67: 1 To obtain the general reduction of the second march, we multiplied the first step in the second, 2.2 x 0.67, to obtain a reduction of 1.47 : 1. This may sound crazy, but if you watch the video, it will have an idea of how it works. Move the change lever to see how the energy is transmitted through the transmission. Most of the automatic transmissions have a 1: 1 ratio in the third march. You will remember the previous section that all we have to do to get a 1: 1 exit is to block any two of the three parts of the planetary gear. With the arrangement in this set of gears, it is still easier - all we have to do is wrap the claws that lock each of the sun gears for the turbine. If both solar gears saw in the same direction, the planet geared the lock because they can only rotate in opposite directions. This blocks the ring gear for the planets and causes everything to spin as a unit, producing a rate of 1: 1 .Move the change lever to see how the energy is transmitted through the transmission. By definition, an overdrive has a faster exit speed than input speed. It is an increase in speed - the opposite of a reduction. In this transmission, engaging the overdrive performs two things from a once time. If you read how the torque converters work, learned about locking torque converters. In order to improve efficiency, some cars have a mechanism that blocks the torque converter so that the engine exit directly to the transmission.Nid transmission, when the overdrive is engaged, an axis that is attached to the housing of the torque converter (which is screwed for the motor steering wheel) is connected by the clutch to the planet carrier. The small free solar gear, and the largest solar gear is maintained by the overdrive band. Nothing is connected to the turbine; The unique entrance comes from the inverter's inverter. Let's go back to our graph again, this time with the conveyor planet for input, the fixed sun gear and the ring gear for the output.ratio = 1 / (1 + S / R) = 1 / (1 + 36 / 72) = 0.67: 1st Saüda turns once for every two tits of a motor rotation. If the engine is spinning in 2000 per minute (RPM) rotations, the exit speed is 3000 rpm. This allows the cars to drive at the speed of the road while the engine speed remains pleasant and slow.Move the change lever to see how the energy is transmitted through the transmission.Severse is very similar To the first equipment, except that instead of the small sun gear being driven by the torque converter turbine, the largest solar gear is directed and the small freewheels in the opposite direction. The planet's conveyor is maintained by the reverse band for the housing. Thus, according to our equations of the last page, we have: Then the proportion in the reverse is a little less than the first equipment in this transmission. The transmission of ratios has four advanced gears and a reverse gear. Let's summarize the gears, inputs and outputs: After reading these sets, you are probably wondering how the different entries connect and disconnected. This is done by a sane of clutches and bands within the transmission. In the next section, we will see how these work. In the last section, we argue as each of the reasons of gears is created by the transmission. For example, when we discussed overdrive, we said: In this transmission, when the overdrive is engaged, an axis that is attached to the housing of the torque converter (which is screwed to the motor steering wheel) is connected by clutch to The planet operator. The small free solar gear, and the largest solar gear is maintained by the overdrive band. Nothing is connected to the turbine; The unique entrance comes from the inverter's inverter. To get the transmission in overdrive, many things should be and disconnected by clutches and bands. The planet conveyor is connected to the housing of the torque converter by a clutch. The small sun is disconnected from the turbine by a clutch so she can Freewheel. The great sun gear is held in the accommodation for a band so 1 could not turn. Each gear change triggers a Like these, with different clutches and bands fit and disabling. Let's take a look at a band.bandsin this transmission has two bands. The bands in a transmission are literally, steel bands that involve sections of the gear train and connect to the accommodation. They are acted by hydraulic cylinders within the case of the transmission. In the figure above, you can see one of the bands in the dwelling of the transmission. The gear train is removed. The metal rod is connected to the piston, which operates the band. As you can see the two pistons that act the bands. The hydraulic pressure, routed into the cylinder by a set of velvules, causes the pistons to push the bands by blocking that part of the gear train to the carton. The claws in the transmission are a little more complex. In this transmission, there are four clutches. Each clutch is triggered by the pressurized hydraulic liquid that enters a piston inside the clutch. Springs ensure that the clutch releases when the pressure is reduced. Below you can see the piston and the clutch drum. Observe the rubber seal on the piston - this is one of the components that is replaced when your transmission is rebuilding. The next figure shows the alternating layers of clutch friction material and steel plates. The friction material is spoiled inside, where it locks for one of the gears. The steel plate is spoiled from the outside, where it locks for the clutch housing. These clutch plates are also replaced when the transmission is rebuilding. Pressure for clutches is fed by passages on the axes. The hydraulic system controls which clutches and bands are energized at any time. It may seem like a simple thing to block the transmission and prevent it from being spinning, but in fact there are some complex requirements for this mechanism. First, you have to be able to disable it when the car is on a hill (the weight of the car is resting on the mechanism). Secondly, you have to be able to involve the mechanism even if the lever is not aligning with the gear. Third, once involved, something has to prevent the lever appear and disengage. The mechanism that does all this is quite cool. Let's look at some of the parts first. The parking brake mechanism involves the teeth in the skirt to hold the car still. This is the section of the transmission that connects to the drive axis - so if this part can not rotate, the car can not move.Above you see the parking mechanism Projecting yourself in the accommodation where the gears are located. Note that you have tapered sides. This helps disengage the parking brake when it is parked on a hill - the car weight force helps push the parking mechanism out of place because of the angle of the tone.This stem is connected to A cable that is operated by the change lever in your car. When the change lever is placed in the park, the rod pushes the spring against the small covenant. If the park mechanism is aligned so that it may fall into one of the notches in the Saüda Gear section, the Cane Cych will push the mechanism down. If the mechanism is aligned at one of the high points in the skirt, the spring is pushed into the dizzy bushing, but the lever will not be blocked until the car rolls a little and the teeth are correctly aligned. That's why sometimes your car moves a little after putting it in the park and releasing the brake pedal - it has to roll a little to the teeth if aligning where the parking mechanism can fall in place. Once the car is surely in the park, the bushing supports the lever so that the car does not leave the park if it is on a hill. Automatic transmission in your car has to do several tasks. You may not realize how many different ways operates. For example, here are some of the characteristics of a transmission If the car is in overdrive (on a four-speed transmission), the transmission will automatically select the gear based on the vehicle speed and the accelerator accelerator pedal it gently accelerate, the changes will occur at lower speeds than if you accelerate the full throttle.if you walk the accelerator pedal, the transmission will be downshift for the next gear.if Moves the change selector to a lower march, the transmission will be downshift unless the car is going fast too much for the arts. If the car is going fast too much, it will wait until the car is slower and then downshift.if you put the transmission in second march, it will never go downshift or increase the march out of the second - even from a complete stop, unless you move the changing change.You've probably already saw something like that before. It really is the automatic transmission control, management of all these functions and more. The passages you can see route fluid for all different components of the transmission. Molded passages inside the metal are an efficient way of route fluid; Without them, many hoses would be required to connect the various parts of the transmission. First, let's discuss the main components of the hydraulic system; Then let's see how the Together The Bucket Transmissions work. It has a pure pump, called a gear pump. The pump is usually located on the transmission cover. The fluid of a reservoir is inspired at the bottom of the transmission and feeds it to the hydro-cell. It is also feeds the transmission refrigerator and the torque convert.The inner pump gear connects with the binary converter box so that it rotates the same speed as the engine. The outer gear is connected by the inner gear, and as the rotating gears, the fluid is aspirated from the reservoir on one side of the growing and forced to leave into the hydro-cell system of the other side regulator. Governororthe is a smart velvule that says the transmission how fast the car goes. It is connected to the skirt, more quickly the car moves, more fast the governor turns. Within the governor is a spring volley that opens in the proportion of how fast the governor is spinning - the fastest the governor turns, plus the velvule opens. Bomb fluid is fed to the governor through shaft.The more fast leave the car goes, plus the speed governor opens and greater the pressure of the fluid leaves through.to change correctly, the transmission Automotica has to know how difficult the engine is working. There are two different ways that this is done. Some cars have a simple connected cable connected to an accelerator valley in the transmission. The more the accelerator pedal is pressed, the more pressure is placed on the bottleneck velvule. Other vehicles use a VACUO modulator to apply pressure on the bottleneck velvule. The modulator detects the pressure on the manifold, which increases when the engine is under a larger manual velvule load.The is the hook change lever until. Depending on which gear is selected, the manual velvule feeds hydraulic circuits that inhibit certain gears. For example, if the change lever is on the third speed, which feeds a circuit that prevents the overtaking of spells Engaging.shift provide hydraulic pressure for the clutches and bands to involve each of the gears. The velvule body of the transmission contains several shift velvules. The shifting velvule determines when switching from a gear to the next. For example, the 1-2 change velvule determines when moving from the first to the second speed. The displacement velvule is pressurized with the fluid from the one-hand regulator, and the bottleneck velvule on the other. They are provided with fluid by the pump, and they route that fluid to one of the two circuits to control which prepare the car works change of change in.The will delay a change if the car is accelerating If the car accelerates gently, the change will occur at a smaller speed. Let's discuss what happens when the car accelerates car Gently. The speed increases, the pressure of the governor builds. This forces the shifting of the velvule along until the first gear circuit is closed, and the second circuit gear opens. Since the car is accelerating in the light accelerator, the accelerator's velvuela does not apply a lot of pressure against change changes The car quickly accelerates, the accelerator's velvule applies more pressure against the shifting velvule. This means that the governor's pressure has to be higher (and therefore the velocity of the vehicle should be more fast) before the change velvule moves far enough to engage the second equipment. Each change velvule responds to a certain pressure range; So when the car is going faster, the change velvule of 2 to 3 will assume, because the governor's pressure is high enough to trigger this velvule. Elected controlled transmissions, which appear in some younger cars, still use hydraulic to act clutches and bands, but each hydro-ruling circuit is controlled by a electrical solenoid. This simplifies plumbing in transmission and allows more advanced control schemes. In the last section we have seen some of the control strategies that mechanically controlled transmissions use. Electronically controlled transmissions have even more elaborate control regimens. In addition to monitoring the vehicle speed and the accelerator position, the transmission controller can monitor the motor speed, if the brake pedal is being pressed, and even the anti-braking system -bloche.using these information and an advanced control strategy based on the fuzzy line - a method of control systems using human type raciocanium -et Electronically controlled transmissions can do things like - Downshift automatically when going down to control speed and reduce wear on brakesupshift when braking in a slippery surface to reduce braking torque applied by motorinhibit upshift by entering a winding roadlet on that survey Inhibiting Upshift as you enter a curve on a winding road. Let's say you're driving on a raised mountain road, wrapped up. When you are driving in the straight layouts of the road, the transmission changes to the second equipment to give you enough acceleration and climbing power. When you come to a curve, you decrease the speed, pulling the foot pedal and possibly apply the brake. Most of the transmissions will increase to the third march, or even overdrive, when you take the goal. So when you accelerate the curve, they will decrease again. But if you were driving a manual transmission car, it would probably leave the car in the same gear all the time. Some automatic transmissions with advanced control systems can detect this situation after you have gone around some of the curves, and "learn" to not rise again. For more information on automotive and related transmissions, check out the links in the next page. Originally published: November 29, 2000 2000

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